INTEGRATED CIRCUITS

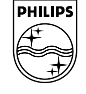
DATA SHEET

TDA7072A/AT
Single BTL power driver

Objective specification
File under Integrated circuits, IC01

July 1994

Philips
Semiconductors





FEATURES

- No external components
- Very high slew rate
- Single power supply
- Short-circuit proof
- High output current (0.6 A)
- Wide supply voltage range
- Low output offset voltage
- Suited for handling PWM signals up to 176 kHz
- ESD protected on all pins

GENERAL DESCRIPTION

The TDA7072A/AT are single power driver circuits in a BTL configuration, intended for use as a power driver for servo systems with a single supply. They are specially designed for compact disc players and are capable of driving focus, tracking, sled functions and spindle motors.

Missing Current Limiter (MCL)

A MCL protection circuit is built-in. The MCL circuit is activated when the difference in current between the output terminal of each amplifier exceeds 100 mA (typical 300 mA). This level of 100 mA allows for headphone applications (single-ended).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	positive supply voltage range		3.0	5.0	18	V
G_v	internal voltage gain		32.5	33.5	34.5	dB
I_P	total quiescent current	V_P = 5 V; $R_L = \infty$	–	4	8	mA
SR	slew rate		–	12	–	V/µs
I_O	output current		–	–	0.6	A
I_{bias}	input bias current		–	100	300	nA
f_{co}	cut-off frequency	–3 dB	–	1.5	–	MHz

ORDERING INFORMATION

EXTENDED TYPE NUMBER	PACKAGE			
	PINS	PIN POSITION	MATERIAL	CODE
TDA7072A	8	DIL	plastic	SOT97[1]
TDA7072AT	8	mini-pack	plastic	SOT96A[2]

Notes

1. SOT97-1; 1996 September 10.
2. SOT96-1; 1996 September 10.

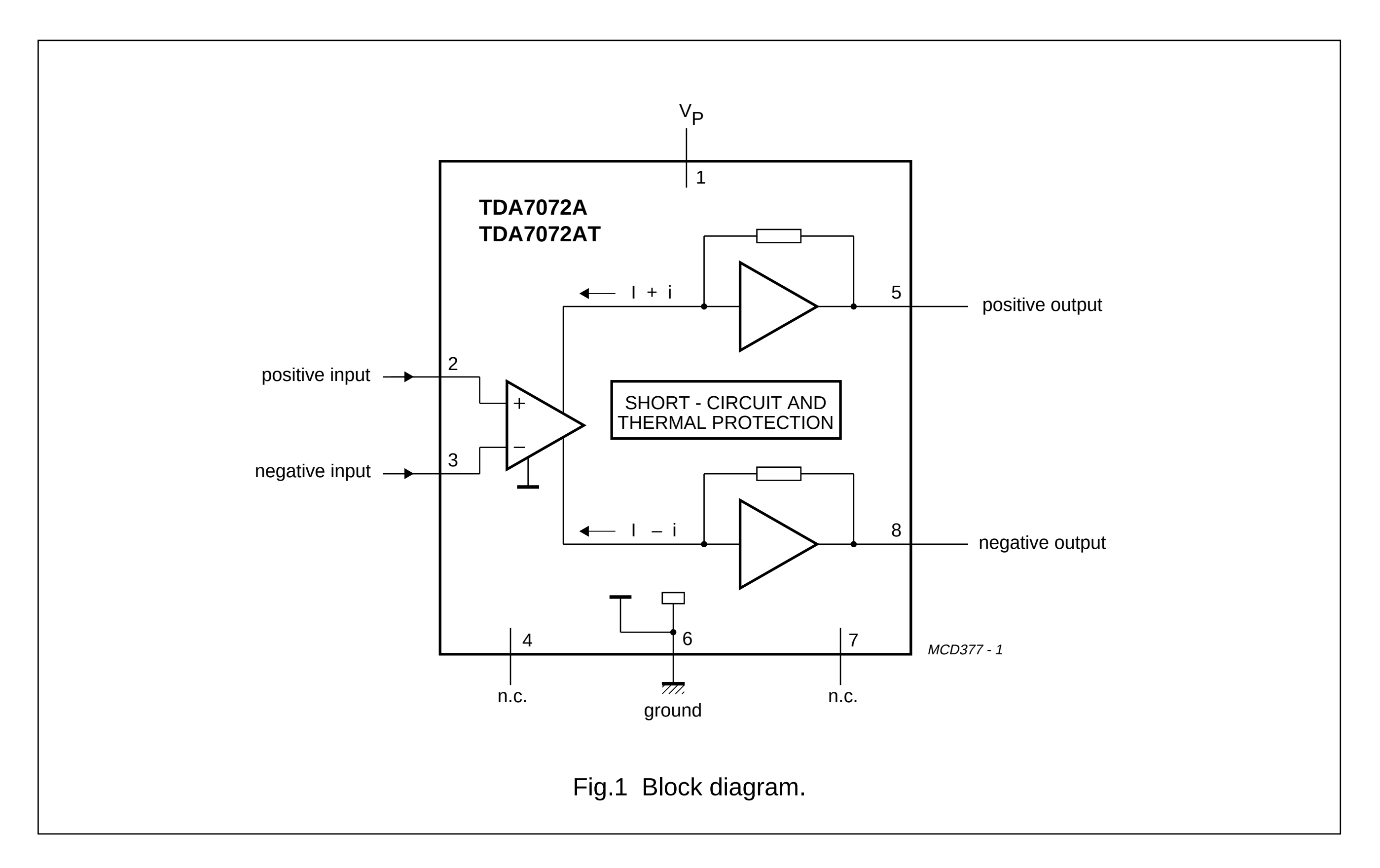


Fig.1 Block diagram.

PINNING

SYMBOL	PIN	DESCRIPTION
V_P	1	positive supply voltage
IN+	2	positive input
IN–	3	negative input
n.c.	4	not connected
OUT+	5	positive output
GND	6	ground
n.c.	7	not connected
OUT–	8	negative output

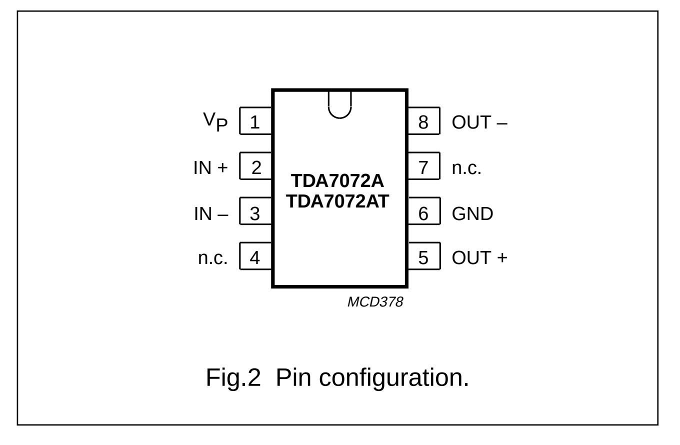


Fig.2 Pin configuration.

FUNCTIONAL DESCRIPTION

The TDA7072A/AT are single power driver circuits in a BTL configuration, intended for use as a power driver for servo systems with a single supply. They are particular designed for compact disc players and are capable of driving focus, tracking, sled functions and spindle motors.

Because of the BTL configuration, the devices can supply a bi-directional DC current in the load, with only a single supply voltage. The voltage gain is fixed by internal feedback at 33.5 dB and the devices operate in a wide supply voltage range (3 to 18 V). The devices can supply a maximum output current of 0.6 A. The outputs can be short-circuited over the load, to the supply and to ground at all input conditions. The differential inputs can handle common mode input voltages from ground level up to (V_P –2.2 V). The devices have a very high slew rate. Due to the large bandwidth, they can handle PWM signals up to 176 kHz.

LIMITING VALUES

In accordance with the Absolute Maximum System (IEC 134.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_P	positive supply voltage range		–	18	V
I_{ORM}	repetitive peak output current		–	1	A
I_{OSM}	non repetitive peak output current		–	1.5	A
P_{tot}	total power dissipation	T_{amb} < 25 °C			
	TDA7072A		–	1.25	W
	TDA7072AT		–	0.54	W
T_{stg}	storage temperature range		–55	+150	°C
T_{vj}	virtual junction temperature		–	+150	°C
T_{sc}	short-circuit time	see note	–	1	hr

Note to the limiting values

The outputs can be short-circuited over the load, to the supply and to ground at all input conditions.

THERMAL RESISTANCE

SYMBOL	PARAMETER	THERMAL RESISTANCE
$R_{th\ j\text{-}a}$	from junction to ambient in free air	
	TDA7072A	100 K/W
	TDA7072AT	155 K/W

Note to the thermal resistance

TDA7072A: V_P = 5 V; R_L = 8 Ω; The typical voltage swing = 5.8 V and V_{loss} is 2.1 V therefore I_O = 0.36 A and P_{tot} = 0.76 W; $T_{amb\ (max)} = 150 - 0.76 \times 100 = 74$ °C

TDA7072AT: V_P = 5 V; R_L = 16 typical voltage swing = 5.8 V and V_{loss} is 2.1 V therefore I_O = 0.18 A and P_{tot} = 0.38 W; $T_{amb\ (max)} = 150 - 0.38 \times 155 = 91$ °C

CHARACTERISTICS

V_P = 5 V; f = 1 kHz; T_{amb} = 25 °C; unless otherwise specified (see Fig.3>). TDA7072A: R_L = 8 Ω; TDA7072AT: R_L = 16 Ω.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_P	positive supply voltage range		3.0	5.0	18	V
I_{ORM}	repetitive peak output current		–	–	0.6	A
I_P	total quiescent current	$R_L = \infty$; note 1	–	4	8	mA
ΔV_{OUT}	output voltage swing	note 2	5.2	5.8	–	V
THD	total harmonic distortion	V_{OUT} = 1 V (RMS)				
	TDA7072A		–	0.3	–	%
	TDA7072AT		–	0.1	–	%
G_v	voltage gain		32.5	33.5	34.5	dB
$V_{no(rms)}$	noise output voltage (RMS value)	note 3	–	75	150	μV
B	bandwidth		–	–	1.5	MHz
SVRR	supply voltage ripple rejection	note 4	40	55	–	dB
$\|\Delta V_{5-8}\|$	DC output offset voltage	R_S = 500 Ω	–	–	100	mV
$V_{I(CM)}$	DC common mode voltage range	note 5	0	–	2.8	V
CMRR	DC common mode rejection ratio	note 6	–	100	–	dB
Z_I	input impedance		–	100	–	kΩ
I_{bias}	input bias current		–	100	300	nA
SR	slew rate		–	12	–	V/μs

Notes to the characteristics

1. With a load connected to the outputs the quiescent current will increase, the maximum value of this increase being equal to the DC output offset voltage divided by R_L.
2. The output voltage swing is typically limited to 2 x (V_P –2.1 V) (see Fig.4).
3. The noise output voltage (RMS value), unweighted (20 Hz to 20 kHz) is measured with R_S = 500 Ω.
4. The ripple rejection is measured with R_S = 0 Ω and f = 100 Hz to 10 kHz. The ripple voltage of 200 mV (RMS value) is applied to the positive supply rail.
5. The DC common mode voltage range is limited to (V_P –2.2 V).
6. The common mode rejection ratio is measured at V_{ref} = 1.4 V, $V_{I(CM)}$ = 200 mV and f = 1 kHz.

APPLICATION INFORMATION

(1) This capacitor can be omitted if the 220 µF electrolytic capacitor is connected close to pin 1.

(1) R_L can be: focus, tracking, sled function or spindle motor.

Fig.3 Test and application diagram.

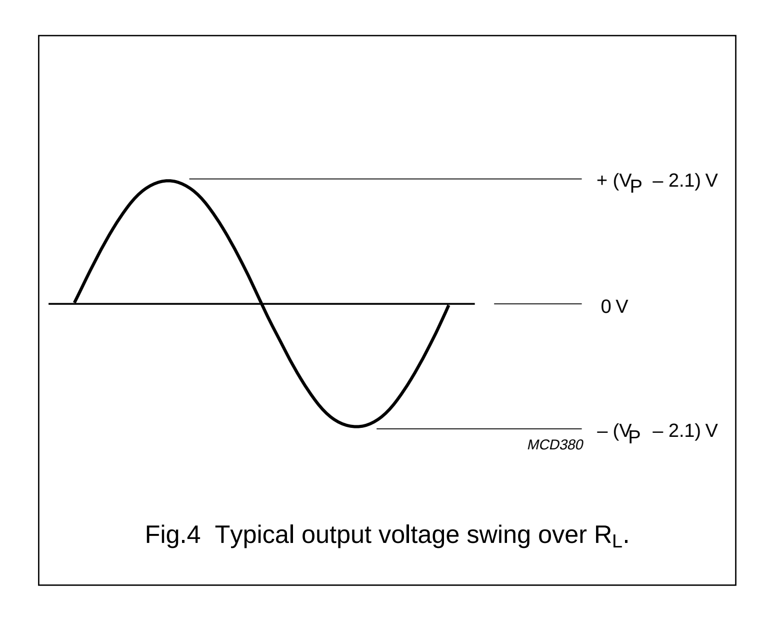
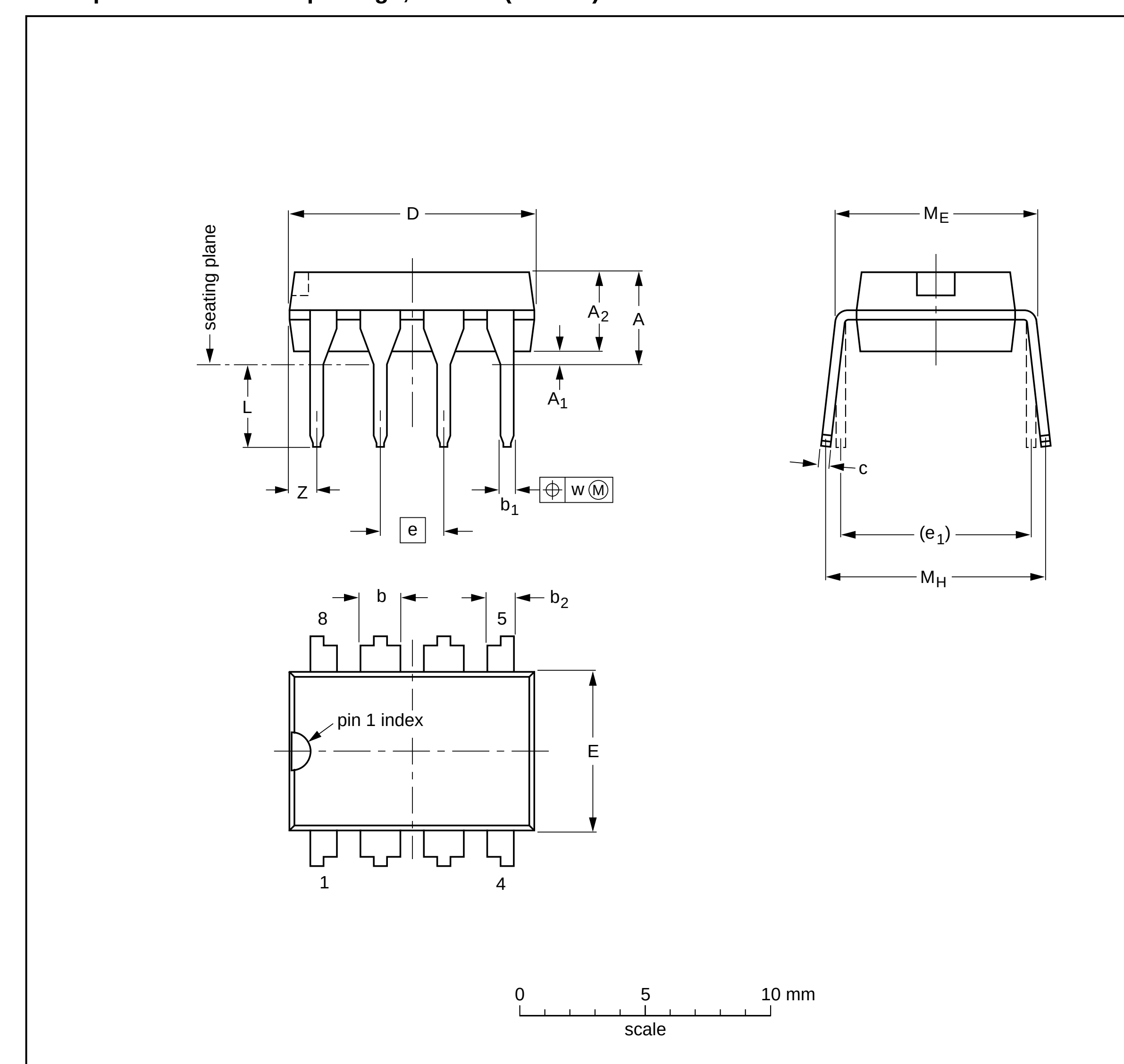


Fig.4 Typical output voltage swing over R_L.

PACKAGE OUTLINES

DIP8: plastic dual in-line package; 8 leads (300 mil) **SOT97-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

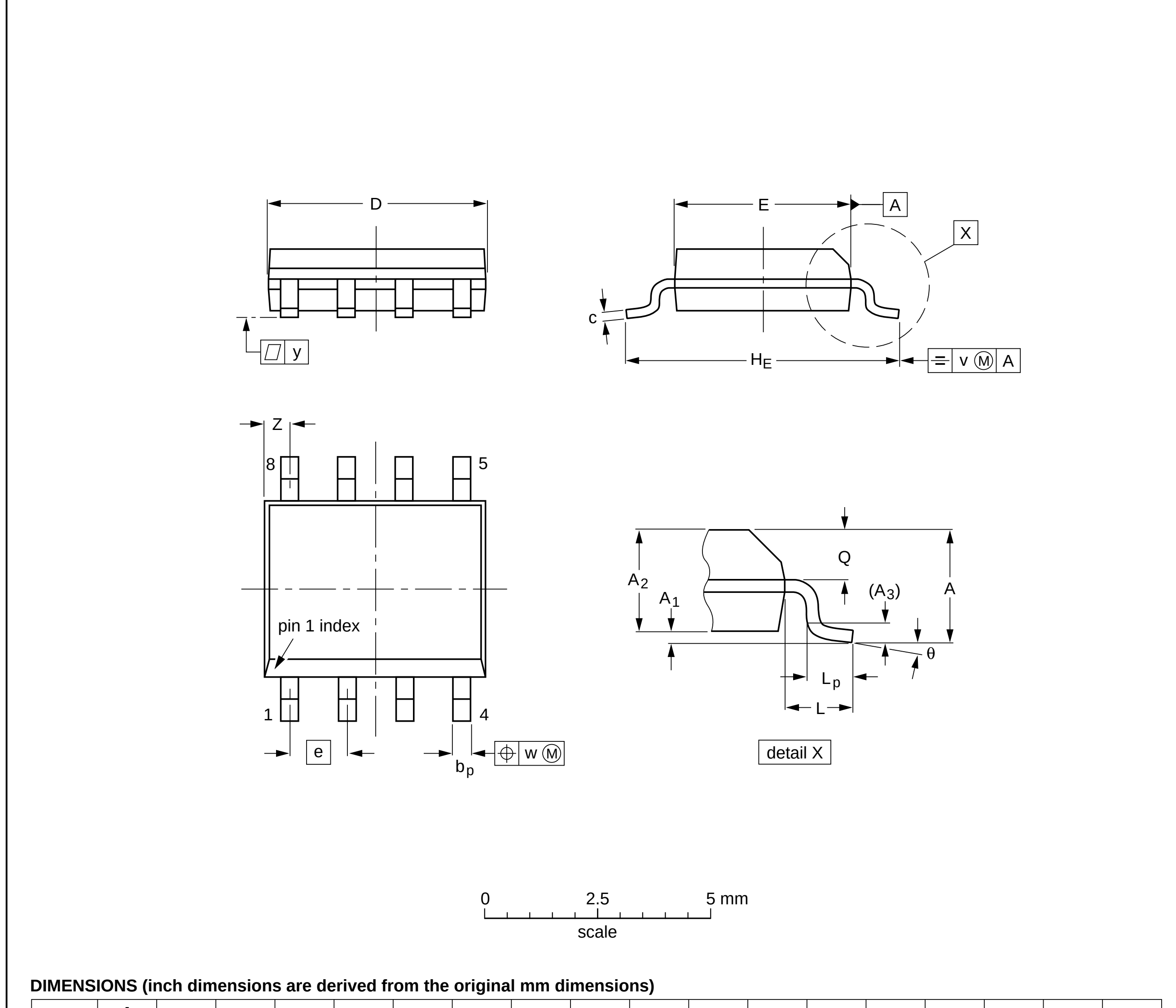
UNIT	A max.	A_1 min.	A_2 max.	b	b_1	b_2	c	D (1)	E (1)	e	e_1	L	M_E	M_H	w	Z (1) max.
mm	4.2	0.51	3.2	1.73 1.14	0.53 0.38	1.07 0.89	0.36 0.23	9.8 9.2	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	1.15
inches	0.17	0.020	0.13	0.068 0.045	0.021 0.015	0.042 0.035	0.014 0.009	0.39 0.36	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.045

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT97-1	050G01	MO-001AN				~~92-11-17~~ 95-02-04

SO8: plastic small outline package; 8 leads; body width 3.9 mm **SOT96-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	5.0 4.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.0098 0.0039	0.057 0.049	0.01	0.019 0.014	0.0098 0.0075	0.20 0.19	0.16 0.15	0.050	0.24 0.23	0.041	0.039 0.016	0.028 0.024	0.01	0.01	0.004	0.028 0.012	

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT96-1	076E03S	MS-012AA				~~92-11-17~~ 95-02-04

SOLDERING

Introduction

There is no soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and surface mounted components are mixed on one printed-circuit board. However, wave soldering is not always suitable for surface mounted ICs, or for printed-circuits with high population densities. In these situations reflow soldering is often used.

This text gives a very brief insight to a complex technology. A more in-depth account of soldering ICs can be found in our *"IC Package Databook"* (order code 9398 652 90011).

DIP

SOLDERING BY DIPPING OR BY WAVE

The maximum permissible temperature of the solder is 260 °C; solder at this temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.

The device may be mounted up to the seating plane, but the temperature of the plastic body must not exceed the specified maximum storage temperature ($T_{stg\ max}$). If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature within the permissible limit.

REPAIRING SOLDERED JOINTS

Apply a low voltage soldering iron (less than 24 V) to the lead(s) of the package, below the seating plane or not more than 2 mm above it. If the temperature of the soldering iron bit is less than 300 °C it may remain in contact for up to 10 seconds. If the bit temperature is between 300 and 400 °C, contact may be up to 5 seconds.

SO

REFLOW SOLDERING

Reflow soldering techniques are suitable for all SO packages.

Reflow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed-circuit board by screen printing, stencilling or pressure-syringe dispensing before package placement.

Several techniques exist for reflowing; for example, thermal conduction by heated belt. Dwell times vary between 50 and 300 seconds depending on heating method. Typical reflow temperatures range from 215 to 250 °C.

Preheating is necessary to dry the paste and evaporate the binding agent. Preheating duration: 45 minutes at 45 °C.

WAVE SOLDERING

Wave soldering techniques can be used for all SO packages if the following conditions are observed:

- A double-wave (a turbulent wave with high upward pressure followed by a smooth laminar wave) soldering technique should be used.
- The longitudinal axis of the package footprint must be parallel to the solder flow.
- The package footprint must incorporate solder thieves at the downstream end.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured.

Maximum permissible solder temperature is 260 °C, and maximum duration of package immersion in solder is 10 seconds, if cooled to less than 150 °C within 6 seconds. Typical dwell time is 4 seconds at 250 °C.

A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

REPAIRING SOLDERED JOINTS

Fix the component by first soldering two diagonally-opposite end leads. Use only a low voltage soldering iron (less than 24 V) applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300 °C. When using a dedicated tool, all other leads can be soldered in one operation within 2 to 5 seconds between 270 and 320 °C.

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

LIFE SUPPORT APPLICATIONS

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